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IS 7199 (2008): Blast Furnace Stove Refractories [MTD 15: Refractories]



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भारतीय मानक
उच्च ताप सह पत्थर की वात्या भट्टी — विशिष्टि
(पहला पुनरीक्षण)

Indian Standard
BLAST FURNACE STOVE REFRACTORIES —
SPECIFICATION
(*First Revision*)

ICS 81.080

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Refractories Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1974. In the present revision following changes have been made in Table 1:

- a) Requirements of 70 percent alumina bricks and silica bricks have been added, and
- b) Bulk density and creep values have been provided.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BLAST FURNACE STOVE REFRACTORIES — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the requirements for blast furnace stove refractories.

2 REFERENCES

The following standards contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
1335 : 1979	Methods for direct determination of alumina in refractory materials (<i>first revision</i>)
1387 : 1993	General requirements for the supply of metallurgical materials (<i>second revision</i>)
1527 : 1972	Methods of chemical analysis of high silica refractory materials (<i>first revision</i>)
12107	Methods of chemical analysis of alumino-silicate refractory materials:
(Part 1) : 1987	Determination of loss on ignition
(Part 2) : 1987	Determination of silica
(Part 3) : 1987	Determination of aluminium
(Part 4) : 1987	Determination of phosphorus
(Part 5) : 1987	Determination of titanium
(Part 6) : 1987	Determination of iron
(Part 7) : 1987	Determination of manganese
(Part 8) : 1987	Determination of calcium and magnesium
(Part 9) : 1987	Determination of sodium and potassium by flame photometry
(Part 10) : 2001	Determination of iron, manganese, calcium and magnesium by AAS method

3 SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of blast furnace stove refractories shall be as laid down in IS 1387.

3.2 The refractories shall be compact, of homogenous texture and reasonably free from cracks, voids and other flaws. They shall be burnt evenly throughout and shall have sufficient mechanical strength and no soft corners.

4 TOLERANCE ON SIZE

Unless otherwise agreed, the maximum variations from specified dimensions to be allowed shall be as follows:

a) Checker-Bricks (Hollow):

Width and length : $\begin{matrix} +0 \\ -4 \end{matrix}$ mm provided that at least 50 percent of the bricks in the offered lot shall fall within the tolerance $\begin{matrix} +0 \\ -3 \end{matrix}$ mm

Height : ± 1.0 percent (for dry process)
 ± 1.5 percent (for plastic process)

b) Checker-Bricks (Rectangular):

Length : $\begin{matrix} +1 \\ -2 \end{matrix}$ mm

Width and thickness : ± 1 mm

c) Other Bricks : ± 1.5 percent or ± 2 mm, whichever is greater

5 TYPES

The blast furnace stove refractories shall be of alumina bricks and silica bricks.

6 CHEMICAL COMPOSITION

Alumina, silica and iron oxide contents of alumina

and silica bricks when determined in accordance with IS 12107 (Parts 1 to 10) and IS 1527 shall be as follows:

	Type 1	Type 2	Type 3	Type 4	Type 5	Silica Brick
Al ₂ O ₃ , percent, <i>Min</i>	70	62	54	45	37	1.0 <i>Max</i>
Fe ₂ O ₃ , percent, <i>Max</i>	1.0	1.5	1.8	2.0	2.0	1.0 <i>Max</i>
Alkali, percent, <i>Max</i>	0.5	0.6	0.6	0.6	1.6	
CaO, percent, <i>Max</i>	—	—	—	—	—	3.0
SiO ₂ , percent, <i>Min</i>	—	—	—	—	—	95

NOTE — The alumina content may also be determined according to the methods given in IS 1335.

7 PHYSICAL REQUIREMENTS

7.1 The physical requirements of blast furnace stove refractories shall conform to the values given in Table 1.

7.2 Cold Crushing Strength

For testing cold crushing strength of hollow checker-bricks a 80-mm height test sample with full cross-section be cut from the middle portion of the cylinder and be levelled at both ends, making them parallel and shall be used as a test specimen. In the case of spalling resistance of a McKee Checker-Bricks a quarter section test piece consisting of full length shall be taken as shown in Fig. 1.

8 MARKING

8.1 Each refractory brick shall be clearly marked with

the manufacturer's name or trade-mark and type of the material.

8.2 BIS Certification Marking

The refractory bricks may also be marked with the Standard Mark.

8.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

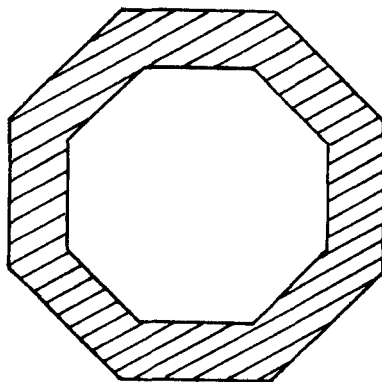


FIG. 1 TEST PIECE FOR DETERMINATION OF SPALLING RESISTANCE OF MCKEE CHECKER-BRICKS

Table 1 Physical Requirements of Blast Furnace Stove Refractories
(Foreword, and Clause 7.1)

Sl No.	Characteristic	Requirement for										Silica Brick	
		Type 1		Type 2		Type 3		Type 4		Type 5		Checker	Solid
(1)	(2)	Brick	Checker	Brick	Checker	Brick	Checker	Brick	Checker	Brick	Checker	(8)	(9)
i)	Pyrometric cone equivalent Reference temperature °C, <i>Min</i>	1 830		1 830		1 800		1 730		1 700		1 700	
ii)	Apparent porosity, percent by volume, <i>Max</i>	20	22	19	21	20	21	18	20	18	20	23	21
iii)	Cold crushing strength, kgf/cm ² , <i>Min</i>	600	400	600	400	400	350	400	350	350	300	300	350
iv)	Permanent linear change after reheating for 2 h at specified temperature, percent	±0.5 at 1 500°C		±0.5 at 1 500°C		±0.5 at 1 500°C		±0.5 at 1 450°C		±0.5 at 1 350°C		±0.2 at 1 500°C	
v)	Refractoriness under load (<i>ta</i>)°C, (2 kgf/cm ²)	1 650		1 550		1 480		1 450		1 350		1 650	
vi)	Spalling resistance (small prism test) 1 000°C to air	+ 30 cycles		+ 30 cycles		+ 30 cycles		+ 30 cycles		+ 30 cycles		—	—
vii)	Bulk density, g/cc, <i>Min</i>	2.50	2.40	2.45	2.35	2.40	2.30	2.20	2.20	2.10	2.10	1.75	1.80
viii)	Creep under 2 kg/cm ² at specified temperature (20 to 50 h), percent, <i>Max</i>	0.25 at 1 500°C		0.25 at 1 450°C		0.25 at 1 350°C		0.25 at 1 250°C		0.25 at 1 200°C		0.20 at 1 500°C	
ix)	True specific gravity, g/cc, <i>Max</i> :												
	Average, <	—		—		—		—		—		2.33	—
	No single value, >	—		—		—		—		—		2.34	—
x)	Residual quartz, percent, average	—		—		—		—		—		1.0	1.0
	Residual quartz, percent, <i>Max</i>	—		—		—		—		—		1.5	1.5

NOTE — For hand moulded shapes physical requirements of apparent porosity, bulk density and cold crushing strength will be same as that of checkers.

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Amendments Issued Since Publication

<i>Amend No.</i>	<i>Date of Issue</i>	<i>Text Affected</i>

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